

Reference Artifacts for NDE

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Reference Artifacts for NDE

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Two reference artifacts will be fabricated for this study. One of the artifacts will have a cylindrical geometry and will contain features similar to those on an SNRT target. The second artifact will have a spherical geometry and will contain features similar to those on a Double Shell target. The artifacts were designed for manufacturability and to provide a range of features that can be measured using NDE methods.

The cylindrical reference artifact is illustrated in Figure 1. This artifact consists of a polystyrene body containing two steps and a machined slot, into which will fit a tracer made of doped polystyrene. The polystyrene body contains several grooves and can be fabricated entirely on a diamond turning machine. The body can be machined by turning a PS rod to a diameter slightly greater than the finished diameter of 2 mm. The part can be moved off-axis to face it off and to machine the steps, slot, and grooves. The tracer contains a drilled hole and a milled slot, which could be machined with a single setup on a milling machine. Once assembled, the artifact could be placed in a Be tube or other structure relevant to target assemblies.

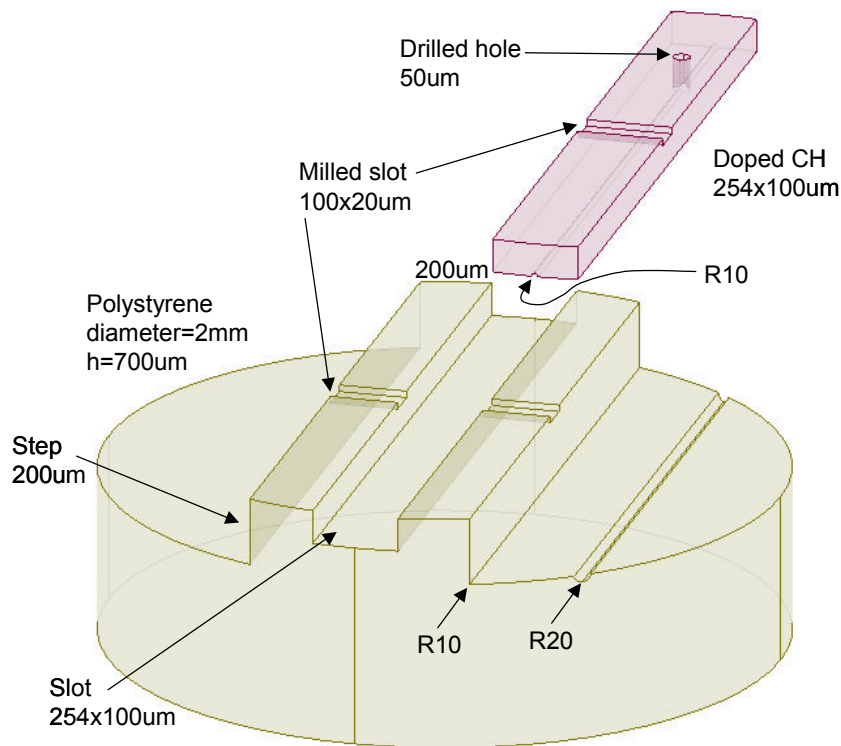


Figure 1. Cylindrical artifact

The assembled artifact will contain many features that could be measured using various NDE methods. Some of these features are listed below.

- Diameter
- Maximum height
- Step height
- Dimensions of upper step
- Radius at the union of the bottom of step and the vertical wall
- Sizes of the grooves

- Distance from step to groove
- Slot width
- Slot height
- Location of the groove beneath the tracer
- Diameter and location of drilled hole in tracer
- Size and location of slot in tracer

The spherical reference artifact is illustrated in Figure 2. This artifact is intended to replicate a double shell target, which consists of concentric polymer spheres separated by aerogel. The artifact consists of an upper hemispherical shell composed of 1% BrCH, which mates via a step joint with a hemispherical component made of polystyrene. This lower component contains a replica of an inner capsule from a double shell target. The “inner capsule” and the bottom portion of the artifact are fabricated as a single piece to ensure dimensional stability. The area between the upper and lower components is filled by a machined piece of CRF aerogel that contains several intentional defects. Each of the components of this artifact can be fabricated on a diamond turning machine.

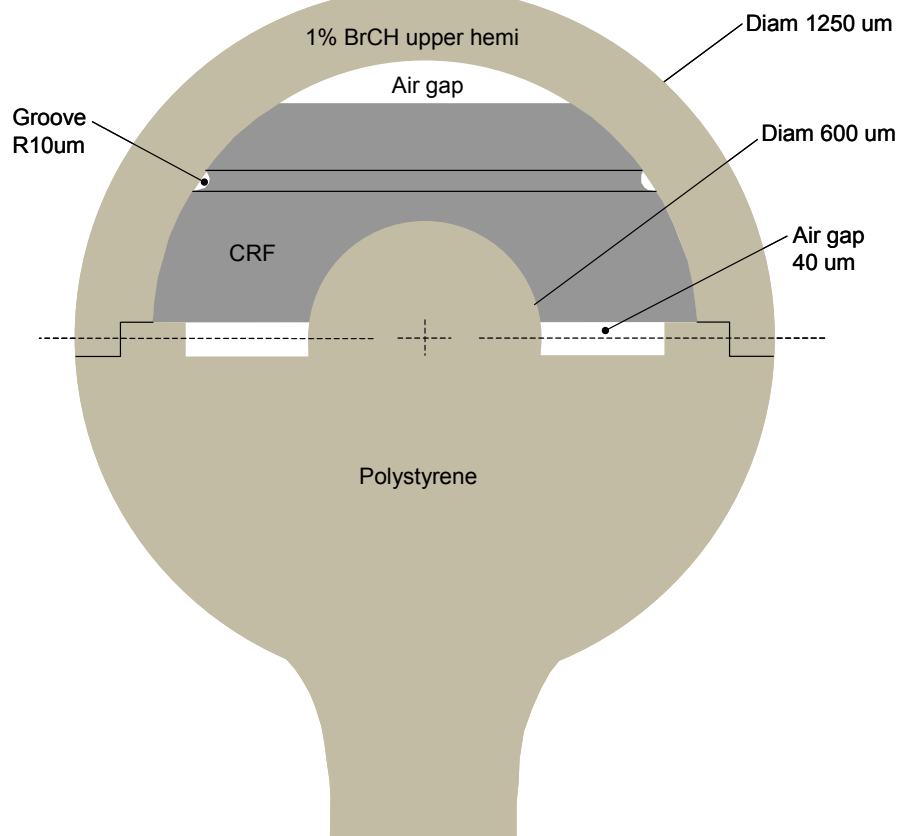


Figure 2. Spherical artifact

The assembled artifact will contain several features that could be measured using various NDE methods. Some of these features are listed below.

- Outer and inner diameters of the upper hemispherical shell
- Diameter of the inner sphere
- Concentricity of outer and inner spheres
- Step joint characteristics

- Total width of step in the lower polystyrene component
- Size of air gap at the top of the CRF
- Size of air gap below the CRF
- Size and location of groove in the CRF